great benefit to early truck and berry growers. Heavy frost on the 5th in the States of the Ohio Valley resulted in little or no damage, as fruit trees were backward in budding. During the second week in April frost occurred in central and northern California, causing some damage to grape vines and tender vegetation. In the north Pacific coast States frost caused heavy damage to fruit.

No severe wind storms occurred on the Great Lakes or the seacoasts of the United States during the month. Several schooners and fishing boats were reported wrecked by high wind on the Yucatan coast on the 23d. During the afternoon of the 6th high wind caused some damage on the north Pacific coast.

CHICAGO FORECAST DISTRICT.

Warnings were sent of the heavy snowstorms of the month in the middle Rocky Mountain region.

No storm that seriously affected navigation passed over the upper Lake region during the month.—*H. J. Cox, Professor.*

SAN FRANCISCO FORECAST DISTRICT.

The showers of the early part of the month were successfully forecast.

Reports of injury by frost during the second week of April were much exaggerated.

About the middle of the month some interesting experiments were made in forecasting fog for the San Francisco Bay region with a good measure of success..—*A. G. McAdie, Forecast Official.*

PORTLAND, OREG., FORECAST DISTRICT.

Warnings were issued for the only severe storm of the month, which occurred on the 6th. This storm wrecked the new wharfs of the Dunsmuir collieries at Ladysmith, near Victoria, B. C., entailing a loss of over $10,000.

The severe frosts of the month were successfully forecast. But little attention was paid to these warnings, although the frosts damaged fruit in Oregon alone to the amount of many thousands of dollars. The Oregonian editorially commented upon the apathy of the fruit growers in this connection, as follows:

> Are not our farmers and fruit growers sufficiently intelligent to take advantage of the work of agricultural experiment stations, of the Weather Bureau and other scientific agencies, by which they gain a livelihood and feed the world? Is it their only privilege to grumble at the payment of taxes that support such institutions? It is to be hoped that the fruit growers are in a receptive condition of mind and that the lesson will now be learned that untimely frosts may be guarded against without money and without price.

E. A. Beals, Forecast Official.

HAVANA FORECAST DISTRICT.

No general storms occurred during the month and no special warnings were issued.

Severe local storms occurred at points in central and western Cuba on the 26th, and in eastern Cuba on the 27th—*W. B. Stockman, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

During the month there were eight highs and eleven lows which could be definitely traced (see Charts I and II). A brief description of some of their most prominent characteristics is given herewith.

Highs.—None of the highs moved entirely across the country. Those which originated, or were first observed in the extreme West, were dissipated before or by the time the one hundredth meridian was reached, and No. II did not leave the Pacific coast. No. I originated in Manitoba, moved slowly southeastward, and disappeared in central Tennessee. Nos. VI and VII originated in Tennessee and Kentucky, respectively, and, after very irregular courses, moved into the Atlantic Ocean by way of Cape Breton Island.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	3, a.m.	50	100	5, p.m.	36	87	1,350	2.5	540	22.5
II	2, a.m.	34	118	4, a.m.	45	123	950	2.0	475	19.8
III	7, p.m.	41	124	10, a.m.	50	100	1,800	2.5	720	30.0
IV	14, a.m.	45	123	17, a.m.	50	100	1,475	3.0	492	20.5
V	17, a.m.	40	115	17, p.m.	40	105	550	0.5	1,100	45.8
VI	14, a.m.	35	85	18, a.m.	46	60	1,775	4.0	444	18.5
VII	19, a.m.	37	87	22, p.m.	46	60	2,450	3.5	700	29.2
VIII	28, a.m.	51	114	30, a.m.	40	105	1,400	2.0	700	29 2
Sums							11,750	20.0	5,171	215.5
Mean of 8 paths							1,469		646	26.9
Mean of 20 days									588	24.5
Low areas.										
I	1, p.m	42	88	4, a.m.	47	65	1,525	2.5	610	25.4
II	1, a.m.	43	123	{14, p.m. {12, a.m.	48 43	69 87	6,300 4,750	13.5 11.0	467 432	19.5 18.0
III	1, a.m.	48	122	3, a.m.	54	114	700	2.0	350	14.6
IV	6, a.m.	33	65	7, p.m.	46	60	1,050	1.5	700	29.2
V	12, a.m.	43	123	20, a.m.	46	60	4,075	8.0	509	21.2
VI	17, p.m.	53	115	18, p.m.	53	105	400	1.0	400	16.7
VII	18, a.m.	26	97	21, a.m.	40	91	1,400	3.0	467	19.5
VIII	19, p.m.	50	110	21, a.m.	44	103	540	1.5	360	12.5
IX	{20, p.m. {21, p.m.	43 48	112 122	22, p.m.	46	106	{1,150 {950	2.0 1.0	575 950	24.0 39.6
X	23, p.m.	37	100	25, p.m.	53	105	1,160	2.0	580	24.2
XI	28, p.m.	50	97	30, a.m.	46	73	1,225	1.5	817	34.0
Sums							28,825	50.5	7,217	298.4
Mean of 13 paths							2,217		555	23.1
Mean of 50.5 days									571	23.8

Lows.—The movements of the lows were extremely erratic throughout the month. No. I originated over northeastern Illinois, moved eastward to the Massachusetts coast, and thence northward. No. II was a remarkable development, occupying thirteen and one-half days for the movement of the main depression across the country, and traversing a path 6,300 miles in length. It originated on the Oregon coast on the morning of the 1st, reaching the Texas panhandle by the evening of the 5th; from this time until the morning of the 10th it shifted irregularly between the Texas coast and southwestern Kansas, again touching the Texas panhandle on the evening of the 8th; it was joined on the morning of the 8th by a secondary depression which had started from western Colorado on the evening before; by the morning of the 11th the center of disturbance had reached central Tennessee, by way of southwestern Mississippi, and there divided, the principal depression moving southward to central Alabama, and thence northeastward and northward to the upper Saint Lawrence Valley. The offshoot continued northward and was lost in western Lower Michigan. During the time this low was moving over Texas there were heavy and persistent rains over the eastern portion of that State. No. III did not move south of the forty-eighth parallel, nor east of the one hundred and fourteenth meridian. No. IV moved northward over the Atlantic Ocean by way of Bermuda, passing off through Newfoundland. No. V originated on the Oregon coast, and, after sending an offshoot to Alberta, moved to western Texas, and

thence northeastward and eastward by way of the upper Lakes to Cape Breton Island, occupying eight days in its passage.

No particular interest attaches to the remaining lows except Nos. VII and X. No. X developed an extremely rare north to west movement from central Kansas to the Saskatchewan Valley, and No. VII also exhibited a westward tendency after reaching southern Mississippi.—*H. C. Frankenfield, Forecast Official.*

RIVERS AND FLOODS.

River affairs along the great systems, the Missouri, Mississippi, and Ohio, were quiet and uneventful during the month. There was more water in the Mississippi and Upper Missouri, and considerably less in the Lower Missouri and Ohio than during March, 1900. Good navigable stages were available throughout the month. In the Mississippi between Helena, Ark., and Vicksburg, Miss., there was an average stage of about 30 feet. When compared with those of April, 1899, the stages show a considerable decrease.

The Lower Tennessee was in flood from the 18th to the 28th, inclusive, on account of heavy rains over its middle watershed, reaching a stage of 19.2 feet at Florence, Ala., 3.2 feet above the danger line, and a stage of 29.1 feet at Johnsonville, Tenn., 8.1 feet above the danger line. Warnings were issued when necessary, and no damage of consequence was reported except the loss of a number of cross-ties at Florence, Ala.

In the rivers of the South Atlantic and the Gulf States matters were more interesting, and the conditions varied from moderate floods in the Carolinas to enormous ones in Mississippi and western Alabama. The Cape Fear River at Fayetteville, N. C., reached 44 feet on the 21st and 22d, 6 feet above the danger line, and the rivers of South Carolina were generally above the flood limits at various times during the third decade of the month. The rivers of northern Georgia were also moderately high, and those of eastern Alabama decidedly so, the Alabama River rising to 36.5 feet at Montgomery, Ala., 1.5 feet above the danger line, and to 41 feet at Selma, Ala., 6 feet above the danger line. Ample warnings of these rises were uniformly given, and no reports of serious loss or damage have been received.

Very severe and disastrous floods occurred in western Alabama and southern Mississippi. The Tombigbee and Black Warrior rivers in Alabama reached the highest stages on record, and the total damage amounted to about $1,500,000. The following report of this flood was prepared by Mr. W. M. Dudley, official in charge of the Weather Bureau office at Mobile, Ala.:

The rivers in this district, the Tombigbee and Warrior, were at good navigable stages from the first of April, 1900, marked falls being checked by frequent rains, especially on the 10th and 11th, when general and heavy rainfalls, ranging from one to over three inches, occurred over the watershed, causing marked rises in the Upper Tombigbee and Warrior rivers, exceeding the danger-line stage at Tuscaloosa, Ala., on the morning of the 12th, the rise being 26.5 feet to a stage of 52.8 feet. This rise continued until the morning of the 16th, when a slight fall began at stations on the Upper Tombigbee and Warrior rivers, with a continued rise on the Lower Tombigbee from Demopolis, Ala., south.

With the stages already abnormally high, excessive and remarkable rainfalls occurred over the watershed on the 16th and 17th. The following are some of the amounts recorded: Columbus, Miss., 4.50 inches; Demopolis, Ala., 9 inches; Tuscaloosa, Ala., 7.15 inches; Livingston, Ala., 10 inches; Macon, Miss., 5.20 inches; Waynesboro, Miss., 3 inches; Warrior, Ala., 3.86 inches.

In anticipation of an unusual flood, warnings were telegraphed on the morning of the 17th to the river observers at Columbus, Miss., and Demopolis and Tuscaloosa, Ala., predicting a 40-foot stage at Columbus, Miss., and a 70-foot stage at Demopolis and Tuscaloosa, Ala., on this rise, that at Demopolis to occur by the close of the week. These warnings were redistributed from these points by mail to places along the rivers, and were instrumental in saving both life and property, particularly live stock, but little of which was lost. Attention is invited to the following extract from a letter of our river observer, Mr. George E. Pegram, Demopolis, Ala.:

"I sent warnings to the following places: Pleasant Ridge, Tishabee, and Forkland, in Green County; Belmont, McDowells, and Whitfield, in Sumpter County, and Jefferson and Myrtlewood in Marengo County, all postoffices, and near the river. The warning was heeded by all but two persons, and all the stock was saved, except by those two, one of whom lost $2,000, and the other about $300 worth of stock."

The steamer *Hattie B. Moore*, which left Mobile, Ala., on the evening of the 17th, for Demopolis, Ala., distributed the warnings to all points along the river, so that the people were duly informed of the impending flood, as the steamer left this end and reached Demopolis before the effect of the flood was felt in the lower river. In this connection is given herewith a letter from Capt. E. B. Kirkbride, General Manager of the Warrior and Bigbee River Packet Company:

"MOBILE, ALA., *May* 12, 1900.

"Mr. W. M. DUDLEY,
"*Weather Bureau, Mobile, Ala.*

"DEAR SIR: On Tuesday morning, April 17, 1900, you reported to this office a rainfall of 4.50 inches at Columbus, 9 inches at Demopolis, and 7.15 inches at Tuscaloosa. At same time you predicted a dangerously high stage of water, resulting from a combination of the good stage of water then in river and the excessive rainfall. Acting upon this prediction, the worth of which had been practically demonstrated on several previous occasions, I requested Captain Stone of steamer *Hattie B. Moore*, leaving that evening for points along the Bigbee and Warrior rivers, to notify the planters that the largest flood of many years was coming down the river and to prepare for it.

"Owing to the quick transmittal of this information many cattle were saved and possibly the loss of human life prevented, whereas in former years such a flood would have caused the loss of several lives and thousands of heads of cattle. Permit me to congratulate you upon the part you have played in this humanitarian effort of the Government.

"I remain, with much respect, yours, truly,
"(Signed) E. B. KIRKBRIDE,
"*Manager.*"

As a result of these excessive rainfalls the rivers rose rapidly, attaining a maximum stage of 27.6 feet at Columbus, Miss., on the 19th, but no damage was done, save in the delay of crops, where lowlands were submerged.

At Tuscaloosa, Ala., on the Black Warrior, the river rose suddenly from a stage of 37.1 feet on the morning of the 16th, to 63.0 feet on the morning of the 17th, reaching a maximum stage of 65.0 feet on morning of 18th, which is 2.4 feet above the previous highest flood on record (April, 1892). The statement of Mr. W. S. Wyman, river observer at this point, is appended:

"TUSCALOOSA, ALA., *May* 11, 1900.

"Mr. W. M. DUDLEY,
"*Official in charge, Mobile, Ala.*

"SIR: I have the honor to submit the following report of the flood of April 16, 1900, in this district:

"On April 16 there occurred the highest and most violent flood on the Black Warrior River ever known in this region. The rainfall was unprecedented, being 8.40 inches at Tuscaloosa, Ala., in a continuous rain lasting about thirty-two hours.

"When this rainfall occurred the river at Tuscaloosa was falling from a recent rise and was over 37 feet on the gage. It began rising again on the afternoon of the 16th and rose very rapidly during the night. It rose less rapidly next morning and culminated at 3 p. m. at 65.16 feet, being 2.40 feet above the previous highest flood on record (April, 1882). Residents below Tuscaloosa report this flood to have been 1½ to 3 feet higher than any previous one within memory. The river began to fall about 4 p. m. April 17, and fell about 1 foot during the night.

"The flooded area is estimated to have been about 8 or 10 square miles, and the damage done consisted mainly in the loss of two iron bridges, many wooden bridges, fences, small houses, lumber, small boats, fertilizer, etc. The damage to crops will probably reach $75,000.

"Flood warnings were mailed at 4 p. m. on April 16 to nine points in Alabama, and it is thought that about $10,000 worth of stock, etc., were saved by them.

"Very respectfully,
"(Signed.) W. S. WYMAN,
"*River Observer.*"

This great volume of water had yet to come down to Demopolis, Ala., at the junction of the Upper Tombigbee and Black Warrior rivers. The rise was not so sudden, but continued steadily to the 22d, when the maximum stage of 68.7 feet was attained, exceeding the previous highest stage (66.0 feet in April, 1874,) by 2.7 feet.

The following is quoted from the report of the river observer at that point:

"The area of land covered by the flood in my district on the Tombigbee and Black Warrior rivers was about seven miles wide, and much damage was done, as most of the overflowed land had been planted,